



# **ZACOM**

## **3 Dimensional Solid Model Technical Data Packages**

---

### **ARDEC**

#### **Configuration Mgt and LifeCycle Integration**

---

**Jeff Windham DSN 782-8162**  
**[Windhamj@ria.army.mil](mailto:Windhamj@ria.army.mil)**

8

7

6

NOTE

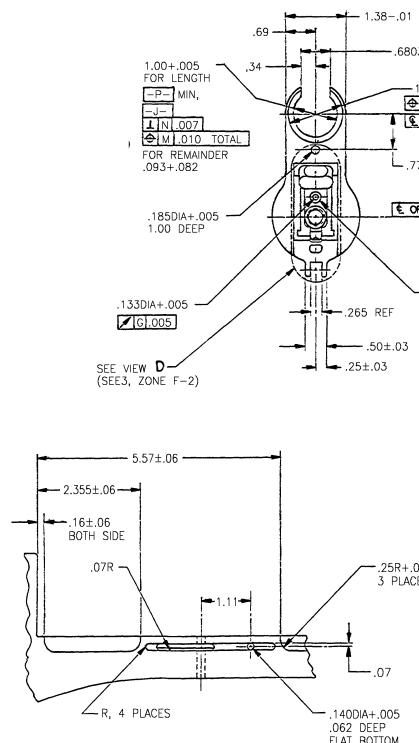
1. FINISH ✓ UNLESS OTHERWISE SPECIFIED.  
2. ALL EDGES SHALL BE BROKEN .005+.010  
UNLESS OTHERWISE SPECIFIED.

UNLESS OTHERWISE SPECIFIED.  
**3. INSIDE CORNER RADII .015-.010 UNLES  
S OTHERWISE SPECIFIED.**  
**4. MATERIAL: FORGING ALUMINUM  
ALLOY 6151 TEMPER T6,  
SPEC QQ-A-367.**  
ALTERNATE, ALUMINUM ALLOY, TEMPER T73,  
SPEC QQ-A-367.

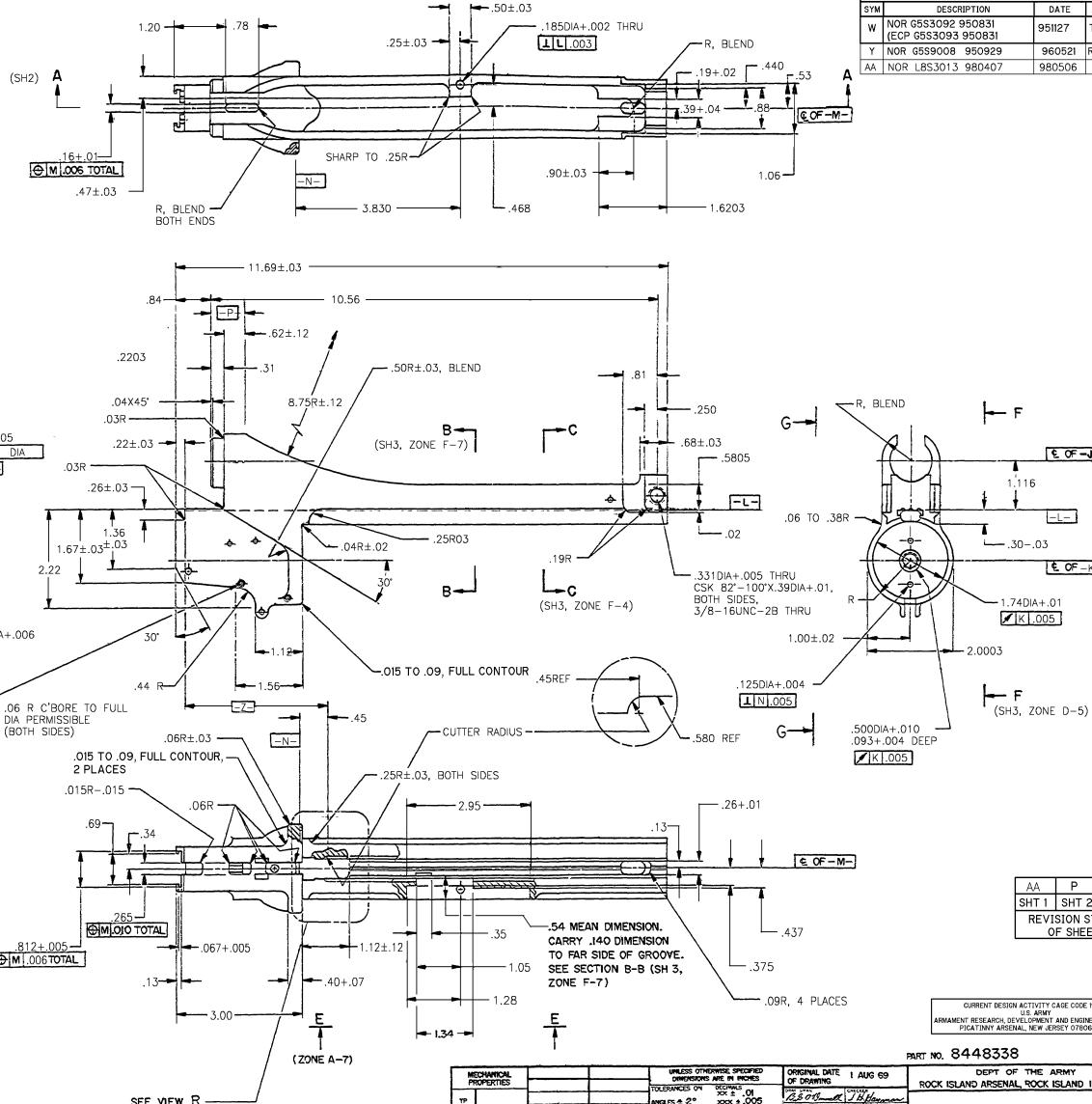
5. FINAL PROTECTIVE FINISH:  
ANODIC FILM, TYPE III, CLASS 2,  
MIL-A-8625, SEAL IN 1 1/4% AQUEOUS  
SOLUTION OF NICKEL ACETATE AT 180°F  
FOR 10 MINUTES. COLOR BLACK NO. 37038  
TO DARK GRAY NO. 36081 OF FED-STD-595.

6 MIL-W-13855 APPLIES.

7. APPLY BAR CODE  
LABEL AS SHOWN IAW TECHNICAL PURCHASE DESCRIPTION/  
SPECIFICATION- U.S. ARMY SMALL ARMS WEAPON LABEL.



VIEW E-E  
(SH 1.ZONE B-4)



MECHANICAL PROPERTIES		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		ORIGINAL DATE OF DRAWING	PART NO. C-17000	
TP		TOLERANCES ON DEGREES & ANGLES A 2° AND .005		1 AUG 69	DEPT OF THE ARMY	
TS		MATERIAL		<i>P. B. Oberholzer</i>	ROCK ISLAND ARSENAL, ROCK ISLAND ILL.	
RA	F 8448380	LAUNCHER, GRENADE,		<i>C. J. Thompson</i>		
BM		40 MM		<i>H. E. Johnson</i>		
RH	M 203	TREAT TREATMENT		<i>S. E. Heberle</i>		
	NEXT ASSY USED ON	FINAL PROTECTIVE FINISH		APPROVED	DRAWN SIZE	CODE IDENT. NO.
	APPLICATION	SEE NOTE 5		<i>D. L. Cole</i>	F 1940	8448388
					SCALE 1/1	UNIT WT
					SHEET 1	OF

SWERI FORM 40F 1 MAR 67

# M9 Pistol Cutaway

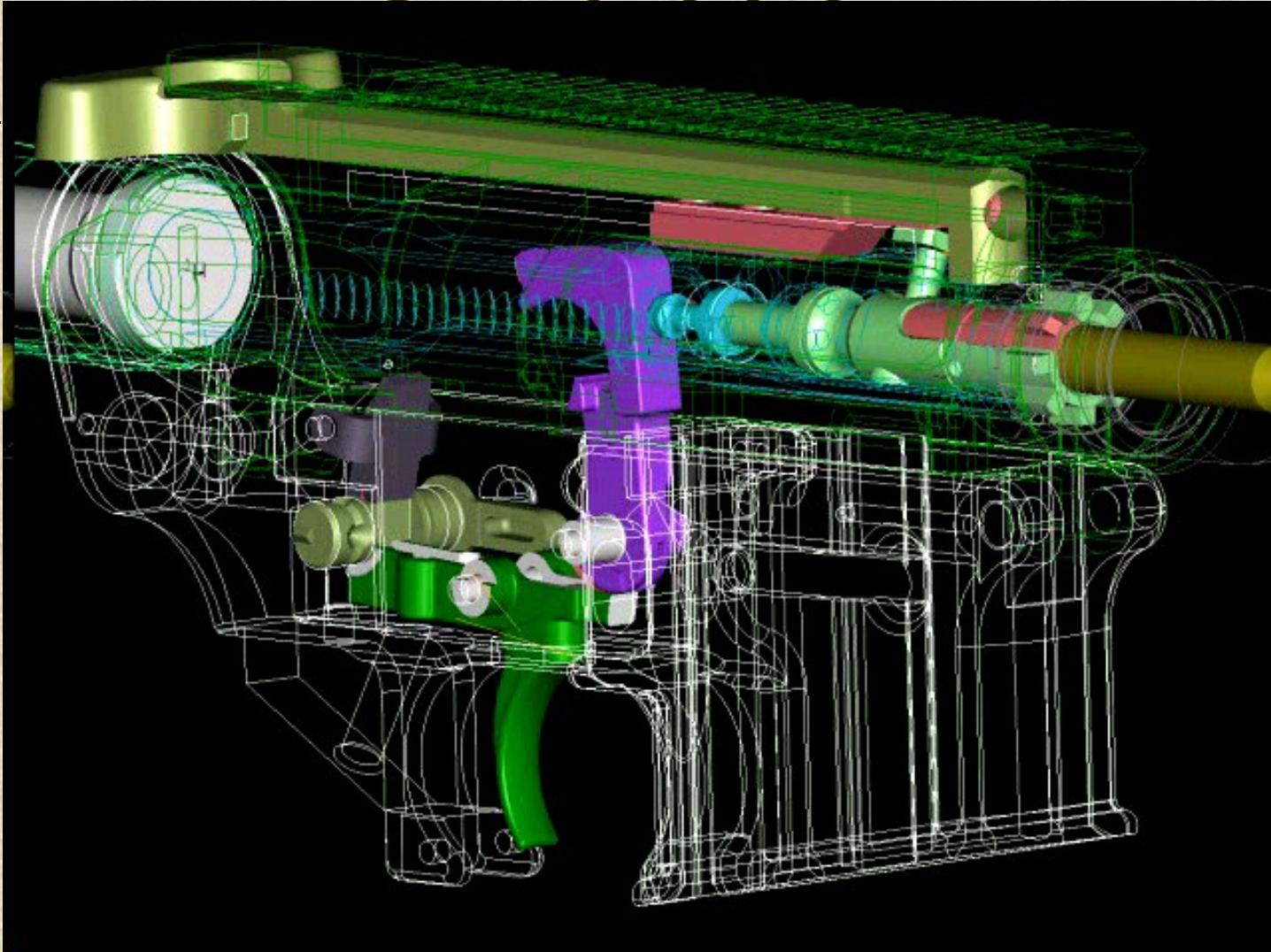


# 3D SOLID MODEL TDP's

---

- ❖ **Goal: To transform our technical data system based on 2-D raster images of line drawings, to a system based on 3-D solid models.**
- ❖ **Build infrastructure so that 3-D tech data can be used for production, design interface and upgrades, logistics support, etc.**

# M4 Simulation



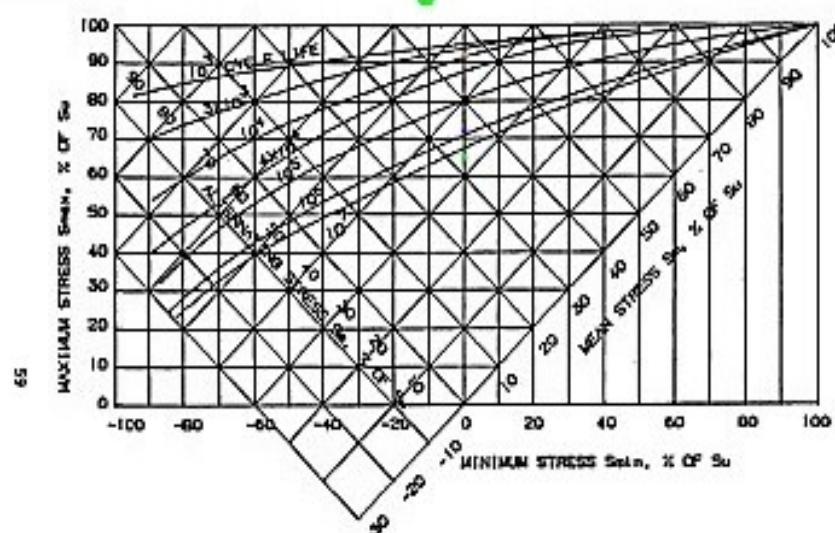
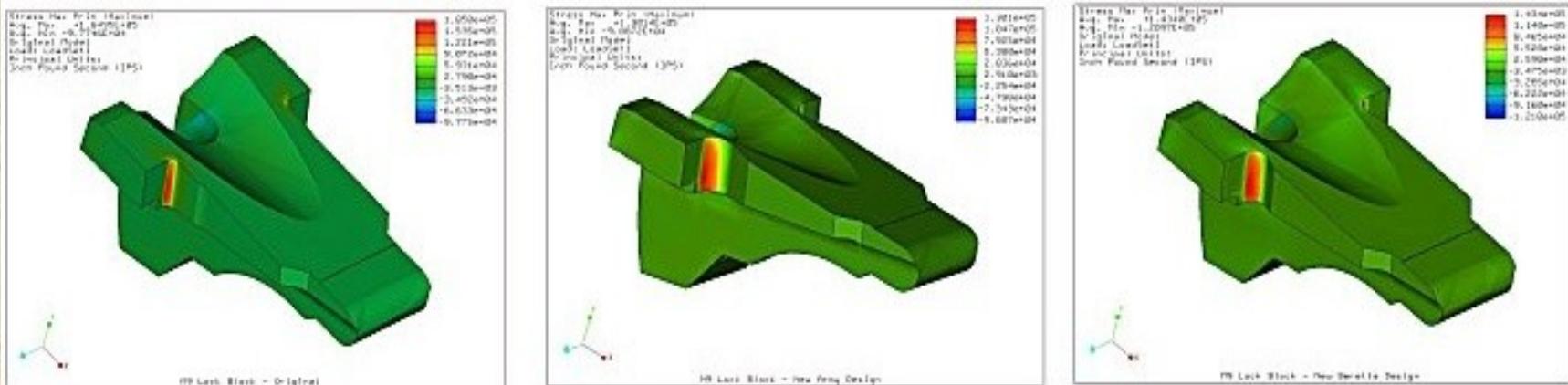
# Rapid Prototype



# Containerized Maintenance Facility



# Engineering Analysis

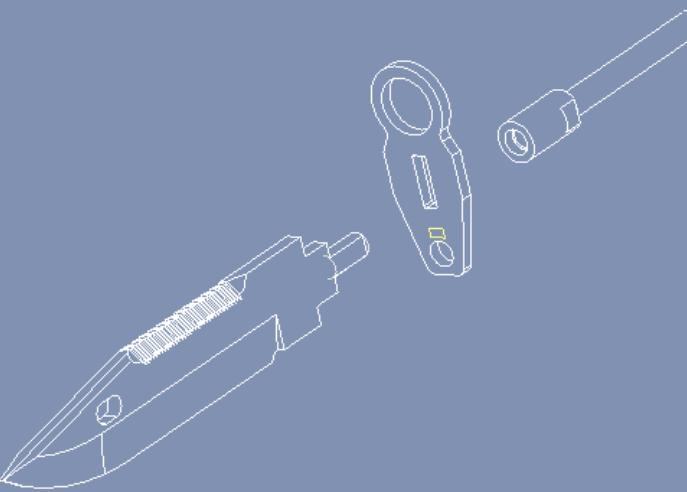


# 3D SOLID MODELS ALLOW AUTOMATED CREATION OF TECHNICAL MANUAL PAGES

(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGE CODE	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODE (UOC)	(7) QTY
					BLADE ASSEMBLY 12598166	
1	NONE		19200	12598163	BLADE	1
2	NONE		19200	12598164	GUARD	1
3	NONE		19200	12598165	ROD, TANG EXTENDING	1

SCALE : 0.700 TYPE : ASSEM NAME : 19200\_12598166 SIZE : A

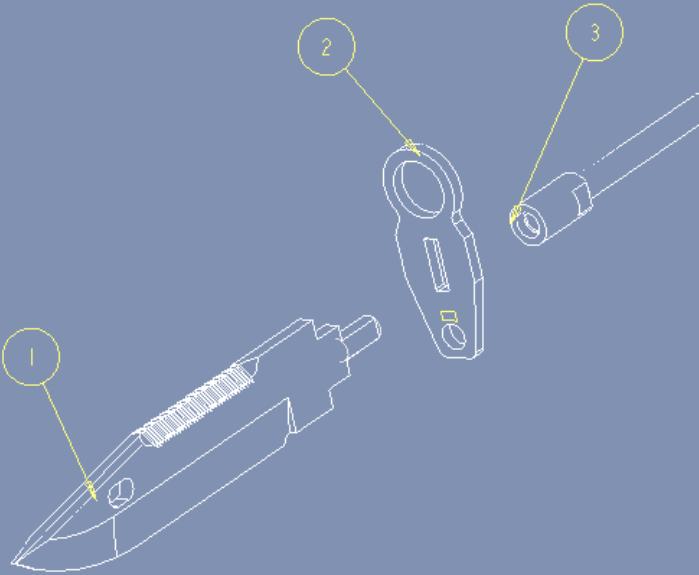
# 3D SOLID MODELS ALLOW AUTOMATED CREATION OF TECHNICAL MANUAL PAGES



(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGE CODE	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODE (UOC)	(7) QTY
					BLADE ASSEMBLY 12598166	
1	NONE		19200	12598163	BLADE	1
2	NONE		19200	12598164	GUARD	1
3	NONE		19200	12598165	ROD, TANG EXTENDING	1

SCALE : 0.700 TYPE : ASSEM NAME : 19200\_12598166 SIZE : A

# 3D SOLID MODELS ALLOW AUTOMATED CREATION OF TECHNICAL MANUAL PAGES



(1) ITEM NO.	(2) SMR CODE	(3) NSN	(4) CAGE CODE	(5) PART NUMBER	(6) DESCRIPTION AND USABLE ON CODE (UOC)	(7) QTY
					BLADE ASSEMBLY 12598166	
1	NONE		19200	12598163	BLADE	1
2	NONE		19200	12598164	GUARD	1
3	NONE		19200	12598165	RBD. TANG EXTENDING	1

SCALE : 0.700 TYPE : ASSEM NAME : 19200\_12598166 SIZE : A

# Advantages of 3D TDP's

---

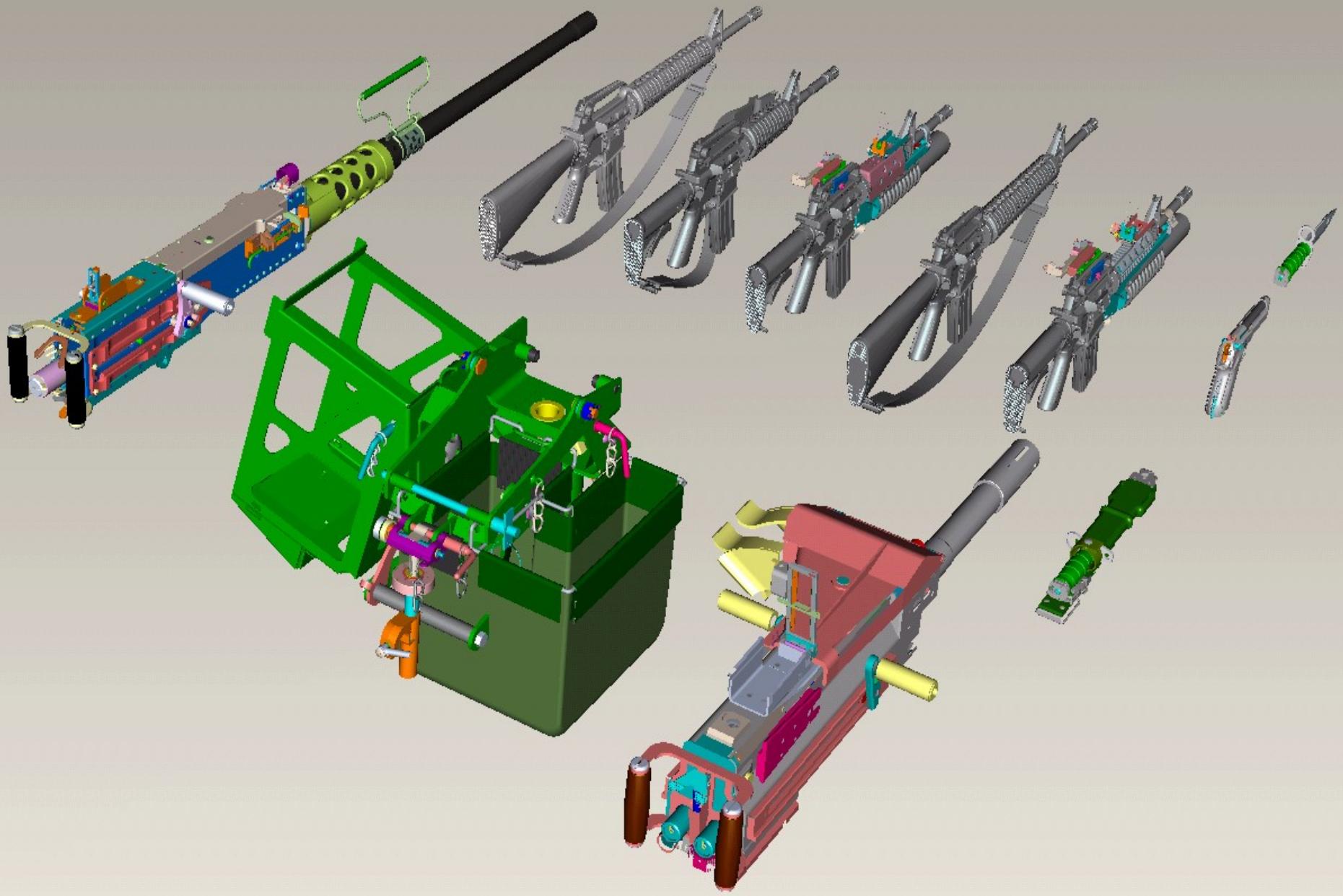
- ❖ **Faster design upgrades**
- ❖ **Build virtual parts and assemblies in the computer**
- ❖ **Infinite viewpoints and exploded views of assemblies**
- ❖ **Reduced manufacturing lead time and cost**
- ❖ **Automated generation and update of line drawings**
- ❖ **Engineering analysis capabilities (stress, thermal, interference fit, tolerance stack-up, etc.)**
- ❖ **Rapid prototyping**



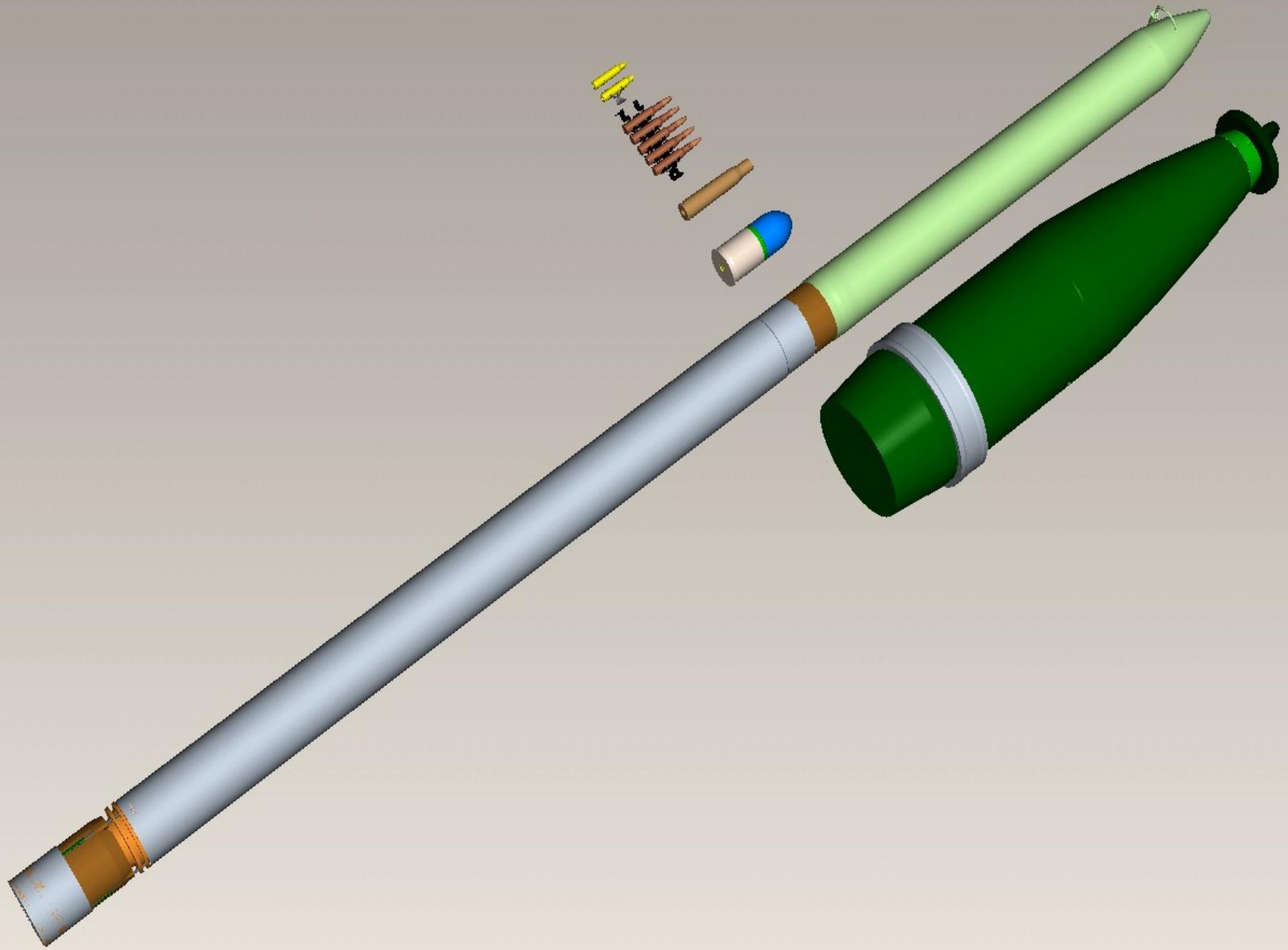
# GETTING TO A 3D ENVIRONMENT

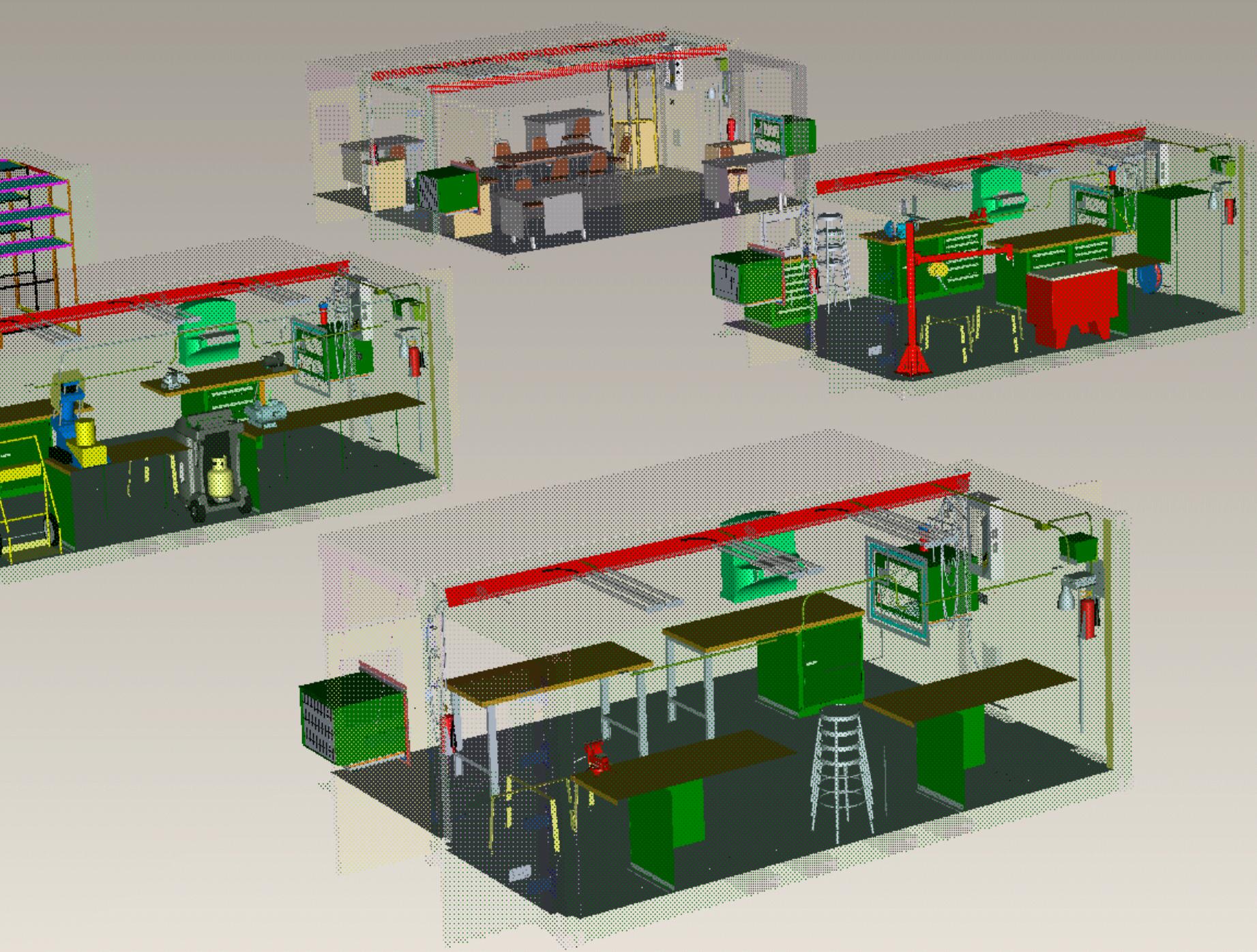
---

- ★ Convert current weapon/ammo systems when it makes good business sense.
- ★ Obtain future system's technical data in 3-D format.
- ★ Low priority legacy systems will continue using 2D system.
- ★ Performance specs (I.e. no tech data of any form) still an option when it makes sense.









# TACOM/ARDEC 3D-TDP Policy

- ❖ Establishes 3D solid model tech data as the preferred technical data format.
- ❖ ARDEC Policy signed by Geza Pap July 02.
- ❖ TACOM Policy signed by MG Thompson Mar 03.
  - ◆ “*TACOM managers will ensure (3D) technical data is implemented to the maximum extent possible ...*”
  - ◆ “*Sole use of 2D based technical data for products in development is strongly discouraged ...*”



# CHALLENGES

---

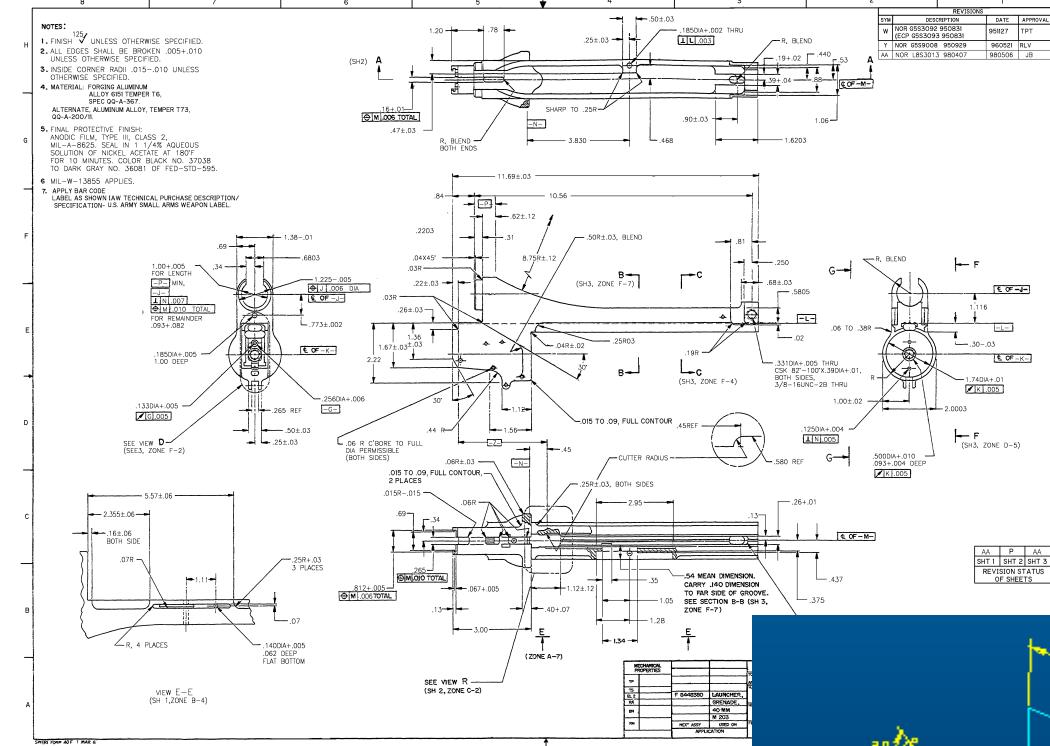
## ★ CAD System interoperability:

- |               |                        |
|---------------|------------------------|
| - Pro/E       | Catia                  |
| - Unigraphics | Solidworks             |
| - Solid Edge  | Mechanical Desktop/Inv |

## ★ Training.

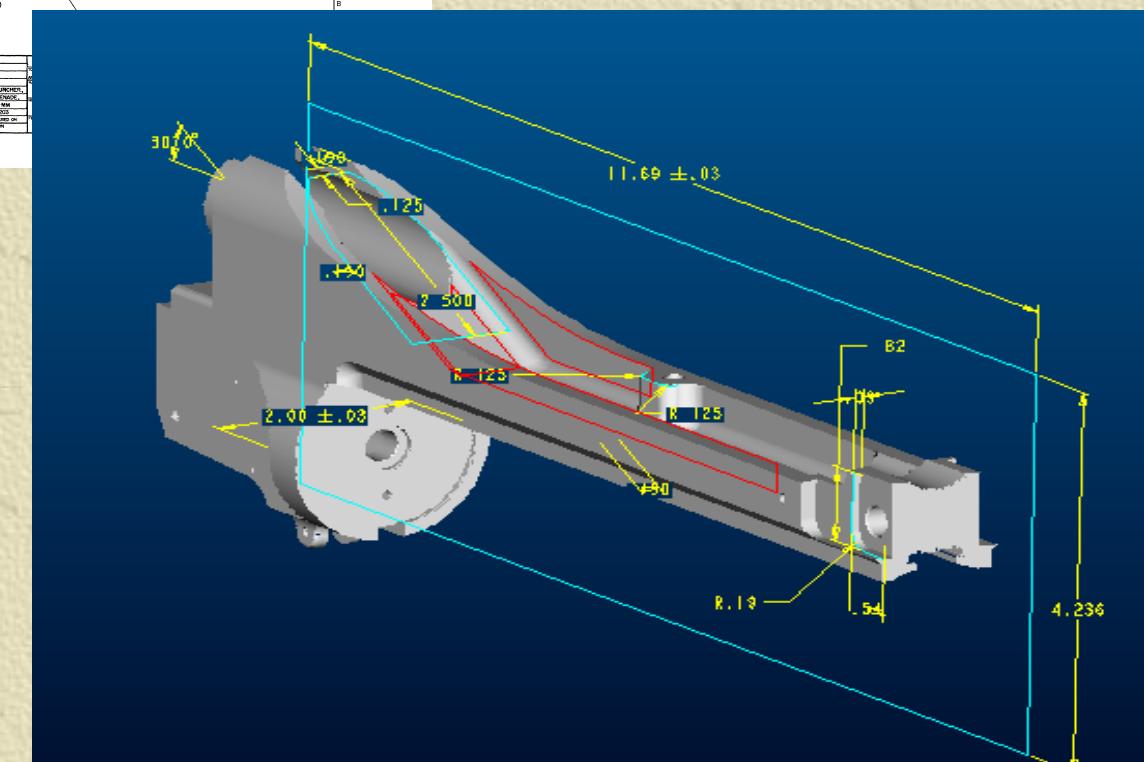
★ Most ARDEC Engineers not using modeling standards and storing models off-line.

★ Interface with DLA and other services.



# FROM THIS

TO THIS





L lethality, Survivability, Mobility and  
Sustainment for America's Army



For more information  
contact:

---

Jeff Windham 309-782-8162  
**Windhamj@ria.army.mil**

[http://w4.pica.army.mil/ardec-  
ri/tacom\\_3d.htm](http://w4.pica.army.mil/ardec-ri/tacom_3d.htm)

♦**BACKUP CHARTS**

# 3D Technical Data Package (TDP) CD-ROMs

- ★ 2 CDs are provided with each 3D TDP request
  - ◆ The information on these CDs is presented in 6 formats which are:

- |           |  |                              |
|-----------|--|------------------------------|
| First CD  | <ol style="list-style-type: none"><li>1. Adobe Acrobat Portable Document Format (PDF) files</li><li>2. JEDMICS .C4 Raster Images (contractual TDP)</li><li>3. Pro/E 2-Dimensional line drawings</li></ol>  | <b>(contractual<br/>TDP)</b> |
| Second CD | <ol style="list-style-type: none"><li>4. Virtual Reality Markup Language (VRML) representation of solid models</li><li>5. Standard Format for the Exchange of Product Data (STEP) format representation of solid models</li><li>6. Pro/Engineer solid Models</li></ol> |                              |
- ◆ Technical Data Package List (TDPL) and Read-me files are also provided on each CD

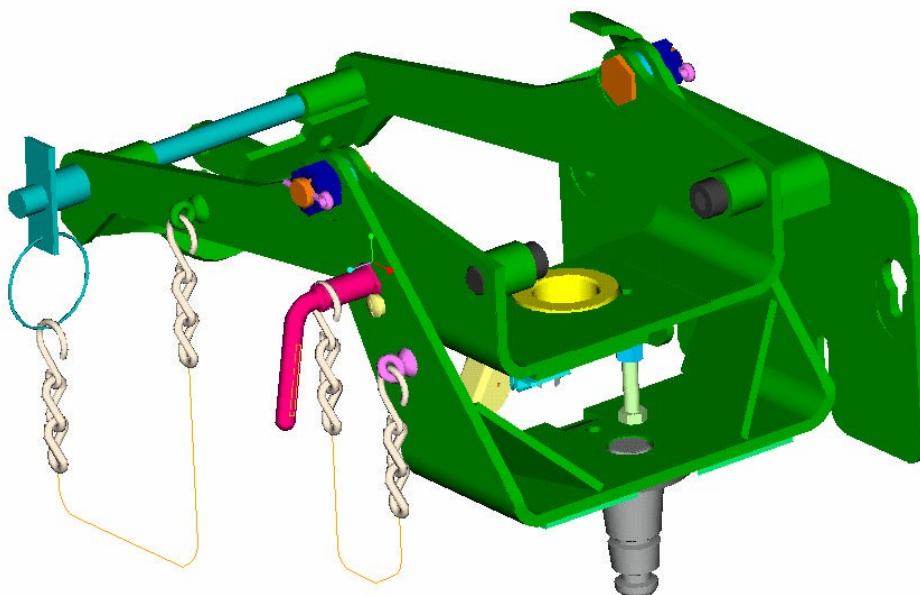
# 3D Technical Data Package (TDP) CD-ROMs (cont)

- ❖ First CD is a JEDMICS generated CD that provides raster images (.C4 and .PDF files)
- ❖ Contractor must adhere and comply with the technical data provided in this CD
- ❖ First CD contains software (ImageR, IndexR) and additional acquisition relative information

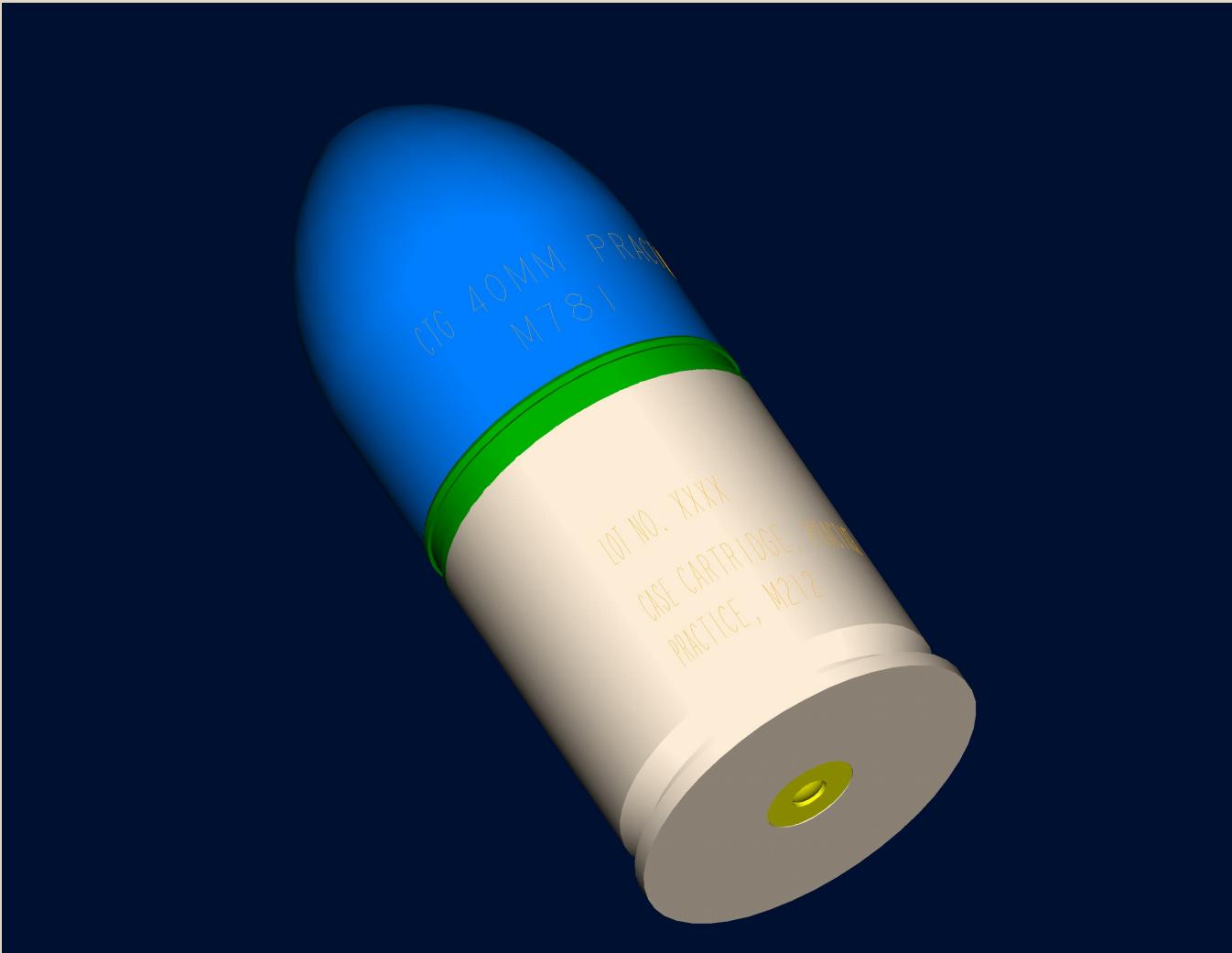
# 3D Technical Data Package (TDP) CD-ROMs

- ❖ Second CD contains the Pro/E solid models, the 2D (from the 3D models) drawings, VRML and STEP files
- ❖ The second CD also contains links to commercial sources to obtain viewers for the different formats provided
- ❖ The second CD is provided to the contractors for information purposes only

# Small Arms Mounts



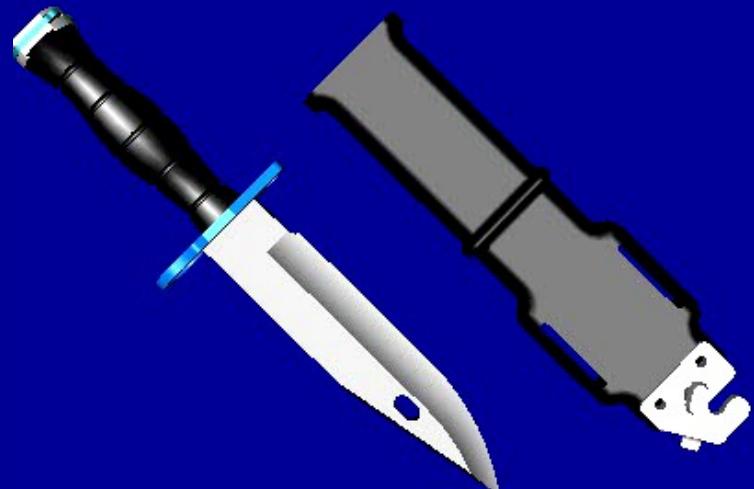
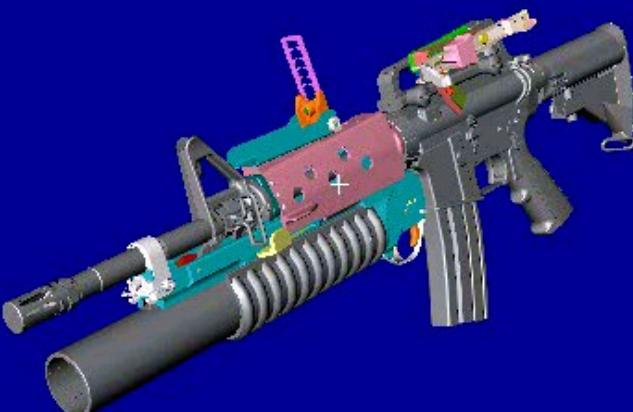
# 40mm M781 Cartridge



# M9 Pistol & Mk19 Grenade Launcher



# M4 Carbine/ M203 Grenade Launcher/ M9 Bayonet

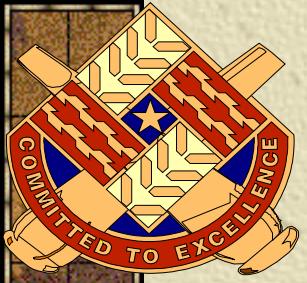


USMC POSSIBLE CHANGES TO  
M9 BAYONET:

- K-BAR STYLE HANDLE
- BLACK HANDLE AND SCABBARD
- REMOVE SAW TEETH

# M240 MG & M16 Rifle





# Tech Data Formats

---

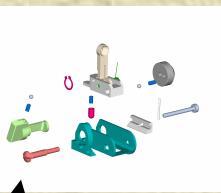
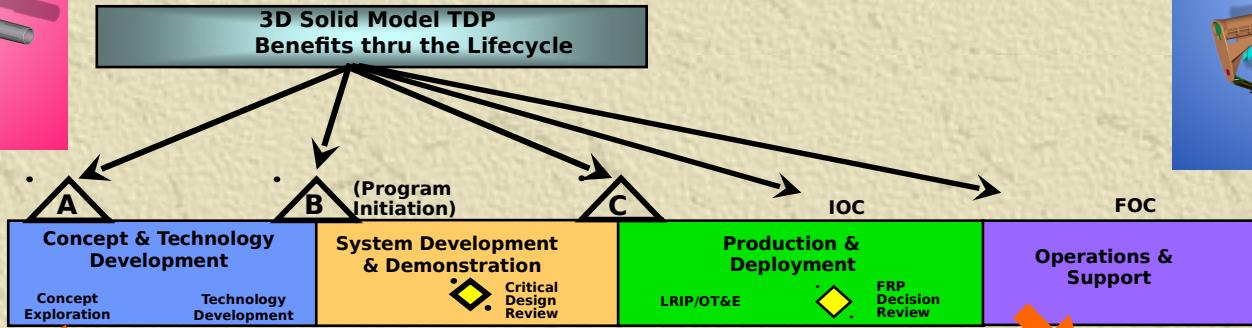
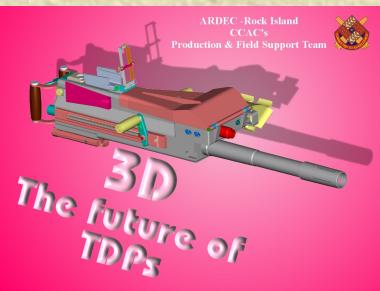
★ Tech data will be delivered in 5 formats:

- Pro/ENGINEER native solid models
- Pro/ENGINEER native drawings
- VRML file of solid models
- STEP file of solid models
- Adobe acrobat (.pdf) drawings  
(contractually binding)

<b>Factors</b>	<b>Weight</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>	<b>Remarks</b>
<b>1. System Density</b>					
<b>2. Future Production Quantities</b>					
<b>3. Remaining Lifecycle</b>					
<b>4. Interface with other Systems</b>					
<b>5. Mechanical Content</b>					
<b>6. Potential Design Changes</b>					
<b>7. Availability of the TDP</b>					
<b>8. Quality of the TDP</b>					



# 3D Tech Data Usage in the Lifecycle



## Concept Exploration

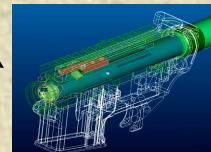
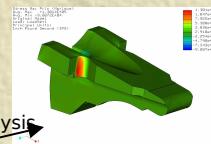
Build virtual parts and assemblies in the computer  
Explore multiple design alternatives  
Infinite viewpoints and exploded views of assemblies  
Virtual Reality Simulation  
Reduces analysis and simulation time  
Create rapid prototypes



## System Development

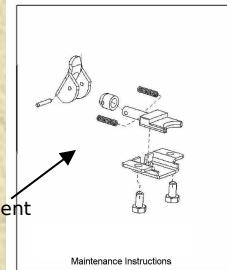
Better and faster engineering analysis  
Stress analysis  
Mechanism design  
Interference fit  
Tolerance stack-up  
Fatigue analysis

Design optimization  
Improved interface with other systems  
Automated generation and update of line drawings  
Automated bill of material  
Generate near perfect TDP



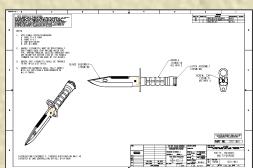
## Sustainment

Technical manual development  
Maintenance training  
Faster design upgrades  
Less time to update drawings  
Increase competition in re-procurement  
Save money on spare part purchases and complete re-buys  
Better and faster problem analysis



## Production and Deployment

Faster and better manufacturing (reduced ALT & PLT)  
Process Planning  
Assembly Planning  
Reduced TDP interpretation errors.  
Tooling design  
Models used to generate CNC codes  
Investment casting  
Mold Design  
Sheetmetal Design  
Routed Systems, Piping and Cabling Design



# 3D TDP Training Requirements

3D TDP Training Course	Training Hours	Training Source
<b>Basic Pro/E</b>	40	In-house, contractor, local
<b>Fundamentals of Drawings</b>	24	In-house, contractor, local
<b>TACOM Modeling Standards</b>	24	In-House
<b>Intralink for Users</b>	16	In-House
Advanced Drawings	40	In-house, contractor, local
Fundamentals of Sheetmetal	24	In-house, contractor, local
Advanced Surfacing	24	Contractor

New Course “3D Solid Modeling for Logisticians” being developed.

# Pro/INTRALINK

---

- Pro/INTRALINK is the database management tool for Pro/ENGINEER files. Features include:**
- Storage of solid model data
  - Controlled distribution of data
  - Configuration management tools
  - Lifecycle management tools
  - Change control (ECP's etc.)



## Commonspace

## Folders on M9 Pistol

- Root Folder
- AIRCRAFT
- AMMUNITION
- ARMAMENT
  - Aircraft
  - Artillery
  - Medium Caliber
  - Small Arms
    - M16 Rifle Series
    - M2 Machine Gun
    - M203 Grenade Lau
    - M240 Machine Gun
    - M249 SAW
    - M9 Bayonet
    - M9 Pistol
    - MK 19 GMG
  - Tanks
- AUTOMOTIVE
- CHEMICAL & BIOLOGICAL
- COMMUNICATION
- DUMPSTER
- LIBRARIES
- MISSILES
- PROE TRAINING
- SHRINKWRAPS
- SOLDIER SUPPORT
- SUPPORT

## Contents of '/Root Folder/ARMAMENT/Small Arms/M9 Pistol'

Name ▾ 1	Revision	Version	Release Level	Nomenclature	Branch	Status Description
19200_9346422.asm	-	0	PRODUCT WIP	BARREL ASSEMBLY	main	
19200_9346422.drw	A	0	PRODUCT WIP	--	main	
19200_9346424.drw	C	0	PRODUCT WIP	--	main	
19200_9346424.prt	-	0	PRODUCT WIP	PLUNGER, LOCKING BLOCK	main	
19200_9346425.drw	G	0	PRODUCT WIP	--	main	
19200_9346425.prt	-	0	PRODUCT WIP	BLOCK, LOCKING	main	
19200_9346426.drw	K	0	PRODUCT WIP	--	main	
19200_9346426.prt	-	0	PRODUCT WIP	BARREL, PISTOL	main	
d63477.prt	-	0	PRODUCT WIP	PIN, SPRING	main	

Workspace Object Edit View Report Frame IntraLink Help



Name: 19200\_12011994.prt

Description:

Created By:

Created On:

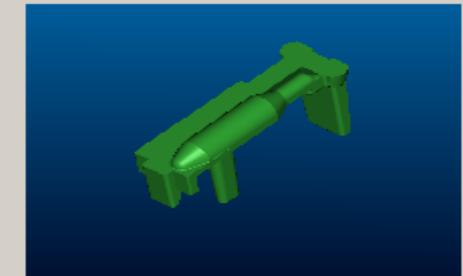
Branch: main

Revision: F

Version: 0

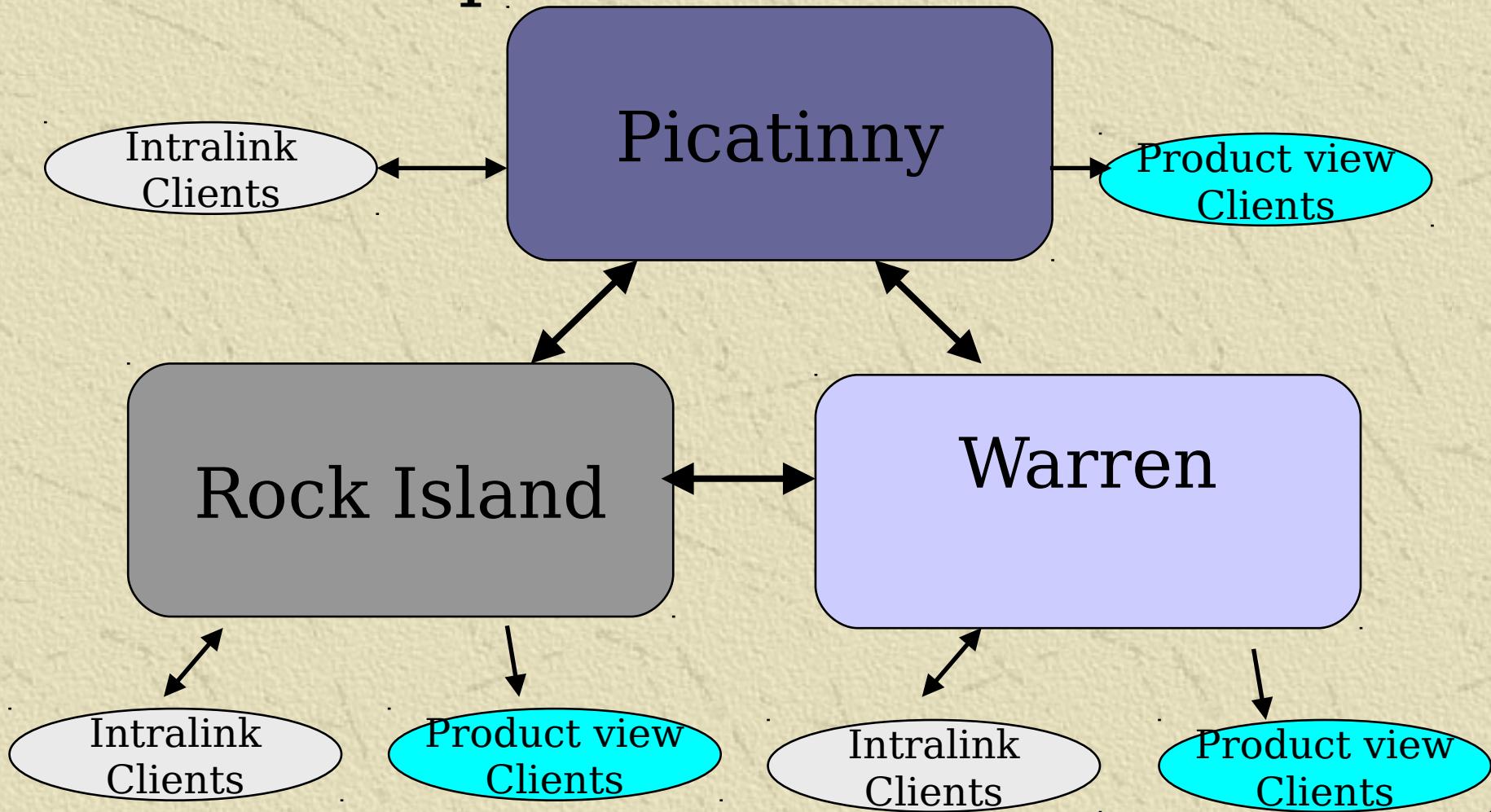
Release Level: PRODUCT WIP

User State:

Object State: Generic  Instance  New  Modified  Read Only 

Attribute	Value
Agency	US ARMY
Cage_Code	19200
Casting	
Catalog_Nomenclature	
Checker_Name	(REQUIRED)
Contract_Number	
Current_Cage_Code	
Design_Activity	ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
Design_Activity_Location	PICATINNY ARSENAL, NEW JERSEY 07806-5000
Design_Approval_Date	YEAR-MM-DD
Design_Approval_Name	(REQUIRED)
Design_Contractor	
Distribution_Code	F
Drawing_Approval_Date	YEAR-MM-DD
Drawing_Approval_Name	(REQUIRED)
Drawing_Date	2000-06-05
Drawing_Rev	
Drawn_By	T. KULIG - ESERV
Engineer_Name_1	J. WINDHAM
Engineer_Name_2	L. KO
Err_Econ_Approval	
Ready	

# Intralink Server-Client Map





# 3D/TDP Outline

---

- ★ 7 release levels
- ★ File folder scheme by system
- ★ 58 parameters maintained in model
- ★ All parts in the pre-production release and production release must have fully defined 2-D line drawings
- ★ 3D/TDP parts will be master for CM purposes
- ★ Jedmics/BA viewer will remain. Source data will be 3D/TDP drawing.



# 3-D/TDP Outline

---

- ❖ Every engineering change will result in a new revision level and vice versa
- ❖ Engineers will incorporate changes to their parts (when possible).
- ❖ Centralized check against standards will remain.
- ❖ Information on drawing such as tolerances, materials, notes etc. Will source from solid model.

